2-WIRE DIAL PULSE TERMINATING WITH INTEGRITY CHECK (DPT9I AND DPT6I) CHANNEL UNIT, 628170 GENERAL DESCRIPTION

CONTENTS PAGE

1. GENERAL 1
2. DESCRIPTION 1
3. FUNCTIONAL OPERATION (FIG. 2) 2
HYBRID 2
TRANSMIT VF CIRCUIT 2
RECEIVE VF CIRCUIT 2
TRANSMIT SIGNALING 2
RECEIVE SIGNALING 2
CARRIER GROUP ALARM 4
BUSY MODE 4
4. OPTIONS 4
5. RESTRICTIONS 4
6. TEST AND MAINTENANCE FEATURES 4
7. TECHNICAL SUMMARY 4
8. REPLACEABLE PARTS 7
9. REFERENCES 7

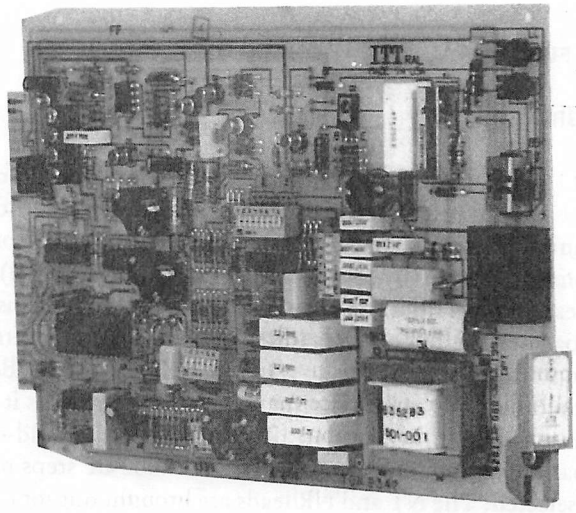


Fig. 1—DTP9I or DPT6I Channel Unit, 628170

1. GENERAL

1.01 This Section provides a general description of the ITT D448 2-wire dial pulse terminating with integrity check (DPT9I and DPT6I) channel unit, 628170 (Fig. 1), to the functional block diagram level.

1.02 This Section has been reissued to update Fig. 2 to the latest issue (-001) and to add information on the handling of CMOS-equipped units.

1.03 The unit provides a voice frequency (VF) and signaling interface between the central office (C.O.) equipment and the D448 multiplex terminal common equipment. In the transmit direction, the unit converts VF and signaling information into pulse code modulation (PCM) for application to the common equipment. In the receive direction, the unit decodes received PCM into VF and signaling information. During system outages, the unit provides various disconnect/make-busy routines for the trunk. The unit provides the terminating end of a 900- or 600-ohm, 2-wire reverse battery loop signaling message circuit.

2. DESCRIPTION

2.01 The unit mounts in the D448 multiplex shelf (channel unit mounting section) in connectors J1A through J24A (for Digroup A) or connectors J1B through J24B (for Digroup B). Installation procedures for the unit are provided in Section ITTR-18-440.

2.02 The unit is available in two groups. Group -0 provides 900-ohm plus 2.16-uF impedance matching. Group -1 provides 600-ohm plus 2.16-uF impedance matching. Group -0 is designated by the mnemonic DPT9I. Group -1 is designated by the mnemonic DPT6I.

2.03 The unit consists of an epoxy-glass printed circuit board (PCB) and associated circuit components. The lower front edge of the PCB is fitted with a handle to facilitate insertion and removal of the unit from the shelf. An identification strip on the handle face indicates the unit mnemonic (DPT9I or DPT6I), last three digits of the model number, last three digits of the part number, and issue letter. The part number and issue letter are also located on the component side of the PCB.

2.04 The LC and IC LEDs (DS1 and DS2), the BSY switch (S5), and the splitting card jack (J1) are located on the front edge of the PCB.

2.05 Printed circuit wiring is etched on both sides of the PCB. The unit inputs and outputs are terminated in gold-plated contacts on the rear edge of the PCB. These contacts mate with a 60-pin contact edge connector on the rear of the multiplex shelf.

3. FUNCTIONAL OPERATION (FIG. 2)

HYBRID

3.01 The hybrid is toll-grade and provides 28-dB (minimum) echo return loss and a 20-dB (minimum) singing return loss. Either the internal compromise network (by selecting DIP switch option [CN]) or an external precision balance network (PBN) may be used to balance the hybrid. Regardless of whether the internal compromise network or an external PBN is used, additional build-out capacitance may be paralleled across it by selecting DIP switch options [2] through [64]. Build-out capacitance from 0.002 to 0.126 uF in 0.002-uF steps may be selected. The NT and NR leads are brought out for connection to an external PBN. If an external PBN is used, the [CN] DIP switch should be opened (not selected).

TRANSMIT VF CIRCUIT

3.02 The incoming VF is transformer-coupled to the low-pass/high-pass filter where it is amplified and filtered. The gain applied to the input signal can be varied over a 3-dB range to compensate for VF input levels from 0 to -3.0 dBm (in 1-dB steps) by the selection of transmit (TX) prescription level DIP switch options [-1], [-2], or [-3]. The resulting signal is passed to the TX office wiring loss (OWL) compensation circuit. The TX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal applied to the encoder to compensate for office wiring/cabling losses. The resultant range for input levels is 0 to -4.5 dBm in 0.1-dB steps.

3.03 The encoder converts the VF signal and signaling information (Para. 3.06 and 3.07) to an 8-bit PCM word. When the TX AND gate is activated by the transmit logic unit (TLU) on the TCS4-X and TCS6-X leads, the 8-bit word is applied to the TLU via the TCD bus. The data is clocked out of the unit under control of the 1.536-MHz clock from the TLU.

RECEIVE VF CIRCUIT

3.04 An 8-bit PCM word from the receive logic unit (RLU) is applied to the decoder on the RCD bus. The decoder will only accept the data when the receive (RX) AND gate is activated by the RLU on the RCS4-X and RCS6-X leads. The decoder converts the PCM word into a VF signal and signaling information (Para. 3.08 and 3.09).

3.05 The VF signal is applied to the low-pass filter and passed through to the RX OWL compensation circuit. The RX prescription OWL options provide 0 to 1.5 dB of gain in 0.1-dB steps to the signal out of the low-pass filter to compensate for office wiring/cabling losses. The output of this circuit is further amplified. This amplification can be varied over a 6-dB range (in 1-dB increments) by the selection of RX prescription VF level DIP switch options [-1] through [-6]. This provides output levels of $+1.5$ to -6.0 dBm in 0.1-dB increments with both the OWL and prescription VF level options. The amplified VF is transformer-coupled to the C.O. equipment.

TRANSMIT SIGNALING

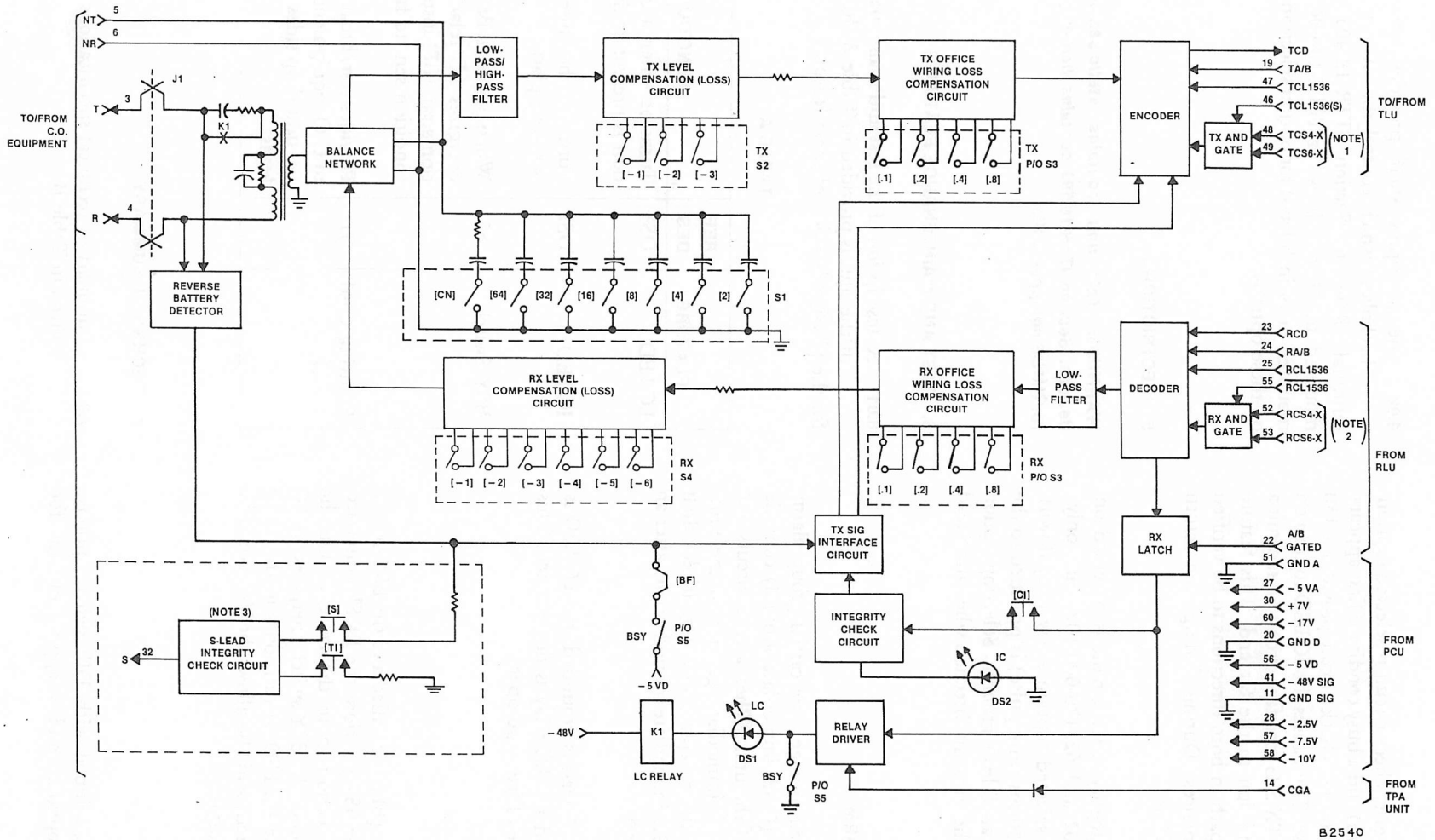
3.06 An idle condition at the 2-wire drop is represented by normal battery polarity (tip-positive, ring-negative) or by an open. A busy condition at the 2-wire drop is represented by reverse battery (tip-negative, ring-positive). The reverse battery detector detects these conditions and signals the TX signaling (SIG) interface circuit as to the status of the 2-wire drop. During an idle condition, the TX SIG interface circuit applies a digital zero to the encoder. During a busy condition, the TX SIG interface circuit applies a digital one to the encoder. The encoder will not process the information supplied to it until it is signaled on the TA/B lead by the TLU that the signaling frame is upcoming.

3.07 The reverse battery detector provides 11 milliseconds of delay before signaling the TX SIG interface circuit that a change in polarity has occurred. This guards against false operation from detecting transients, such as those due to dial pulsing and opening of the T and R leads.

RECEIVE SIGNALING

3.08 The decoder converts receive signaling information from the 8-bit PCM word when it is signaled by the RLU on the RA/B lead that the signaling frame is being processed by the terminal. The decoded signaling information is applied to the RX latch.

3.09 During a busy condition, the LC relay is energized and the LC LED is turned on. Energizing of the LC relay seizes the office equipment. During an idle condition, the LC relay releases the office equipment. Dial pulse



NOTE:
1. MAY BE TCS4-A, B, C, OR D AND TCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.
2. MAY BE RCS4-A, B, C, OR D AND RCS6-A, B, C, D, E, OR F DEPENDING ON POSITION.
3. PROVIDED ON 628170-000-002 OR 628170-000-102 UNITS ONLY.

Fig. 2—DPT9I or DPT6I Channel Unit, 628170, Functional Block Diagram

information sent from the far end is relayed to the office equipment by this relay.

3.10 When the integrity check circuit is selected (option screw [CI] down) and a busy condition first appears at the far end, the integrity check circuit provides a 150 ± 25 millisecond pulse. This causes the IC LED to turn on momentarily and the TX SIG interface circuit to transmit a momentary busy condition to the far end. This feature allows the signaling path in both directions to be verified before dialing commences. During dialing, the return integrity pulse is inhibited.

3.11 The S-lead integrity check circuit is provided on 628170-000-002 and 628170-000-102 units only. When the circuit is selected (option screw [TI] down), return supervision (150-ms wink pulse) is provided to the far-end office upon an S-lead ground. Selecting option screw [S] also busies the transmit direction when the S lead is grounded.

CARRIER GROUP ALARM

3.12 During a system outage, one carrier group alarm (CGA) signal (CGA immediate ground) controls the CGA functions of the unit. When a CGA occurs, the CGA lead provides an immediate ground to the unit. Strapping options on the backplane of the multiplex shelf control when the CGA immediate ground occurs after an alarm signal is received.

3.13 When the CGA lead is grounded, the LC LED is turned off and the LC relay is deenergized. This forces the loop to the office to go open.

BUSY MODE

3.14 If option strap [BF] is installed and the BSY switch is placed in the BSY position, the TX SIG interface circuit sends a busy condition to the far end. On the receive side, operation of the BSY switch energizes the LC relay. This causes the LC LED to turn on and the office equipment to be seized, and also allows the VF path to be completed for test purposes.

4. OPTIONS

4.01 The unit is equipped with DIP switch options, screw-down options, and strapping options for selecting circuit options. Refer to Section ITTR-18-440 for detailed information on option selection.

4.02 The multiplex shelf provides options on the backplane which control the CGA timing of the terminal. Refer to Section ITTR-18-405 (for shelves mounted in 23-inch bays) or ITTR-18-406 (for shelves mounted in 19-inch bays) for option selection information on these options.

5. RESTRICTIONS

WARNING: This unit contains static-sensitive (CMOS) devices. Section ITTR-18-599 contains handling instructions for CMOS-equipped units.

6. TEST AND MAINTENANCE FEATURES

6.01 A description of the test and maintenance features of the unit is provided in Table A. Refer to Fig. 1 for the physical location of these features.

TABLE A

FEATURE	REF. DES.	FUNCTION
LC LED	DS1	Turns on when a busy condition is present at the far end.
IC LED	DS2	Turns on when integrity check is taking place.
BSY Switch	S5	When placed in BSY position, energizes LC relay; with option strap [BF] installed, busy condition sent to far end.
Splitting Card Jack	J1	Provides test/break jack access to C.O. equipment and channel unit drop sides of T and R leads.

7. TECHNICAL SUMMARY

7.01 A summary of technical specifications for the unit is given in Table B.

TABLE B

ITEM	SPECIFICATION
DC POWER	
Voltage	**Current Drain (nominal)**
– 5V	24 mA
– 10V	2.0 mA (at 5V)
+ 7V	5.0 mA (at 12V)
– 17V	8.0 mA (at 12V)
– 48V Signaling Battery	0 to 8.5 mA, depending upon signal conditions
VF PERFORMANCE	
Impedance	
DPT9I (628170-0)	900 ohms plus 2.16 uF
DPT6I (628170-1)	600 ohms plus 2.16 uF
Levels	
Transmit	0 to – 4.5 dBm, adjustable in 0.1-dB steps
Receive	+ 1.5 to – 6.0 dBm, adjustable in 0.1-dB steps
Loss Stability (End-to-End)	± 0.5 dB over life in 95% of the circuits
Tracking (End-to-End)	
– 37 to + 3 dBm0 Input	0.5 dB maximum deviation
– 50 to – 37 dBm0 Input	1.0 dB maximum deviation
Idle Channel Noise (End-to-End)	23 dBrnc0 maximum
Signal-to-Distortion	
0 to – 30 dBm0 Input	33 dB minimum overall; 35 dB minimum receive or transmit
– 40 dBm0 Input	27 dB minimum overall; 29 dB minimum receive or transmit
– 45 dBm0 Input	22 dB minimum overall; 25 dB minimum receive or transmit
Single Frequency Distortion (at 0 dBm0)	
Input Swept from 0 to 12 kHz	– 28 dBm0 maximum at any other frequency
Input between 1004 and 1020 Hz	– 40 dBm0 or less at any other frequency of 0 to 4 kHz with a distortion contribution objective from either transmit or receive of typically 6 dB better
Transhybrid Loss	
200 to 500 Hz	20 dB
500 to 1000 Hz	30 dB for DPT9I, 28 dB for DPT6I
1000 to 2500 Hz	35 dB for DPT9I, 30 dB for DPT6I
2500 to 3400 Hz	30 dB for DPT9I, 28 dB for DPT6I
Echo Return Loss (Measured against nominal impedance with 25 ohms in series with channel unit and no far-end channel unit)	28 dB minimum
Singing Return Loss (Measured against nominal impedance with 25 ohms in series with channel unit and no far-end channel unit)	20 dB minimum
Frequency Response (DPT9I) (Referenced to 1020 Hz, End-to-End)	
60 Hz	20.0 dB minimum loss
200 Hz	0 to – 5.0 dB
300 to 3000 Hz	+ 0.5 to – 1.0 dB
3200 Hz	+ 0.4 to – 1.5 dB
3400 Hz	0 to – 3.0 dB
Frequency Response (DPT6I) (Referenced to 1020 Hz at 0 dBm0, End-to-End)	
600 to 2400 Hz	± 1.0 dB
300 to 3400 Hz	+ 1.0 to – 3.0 dB

TABLE B (CONT)

TABLE B (CONT)

ITEM	SPECIFICATION
Balance Network	Compromise network of 900 or 600 ohms + 2.16 uF built-in and with BOC in 0.002-uF steps to 0.126 uF (NT and NR brought out for connection to external precision balance network)
Delay Distortion (End-to-End)	94 PAR (minimum)
Longitudinal Balance (AT&T Method)	
200 Hz	66 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
Longitudinal Balance (IEEE Method)	
200 Hz	60 dB minimum
1000 Hz	60 dB minimum
3000 Hz	58 dB minimum
SIGNALING	
DPO/DPT Channel Units	
Pulsing Distortion	
Input (at DPO)	150/150 ohm battery-ground pulsing at 12 pps, 73% break over 600-ohm VF extension to the channel unit
Output (at DPT)	71% break maximum
Input (at DPO)	150/150 ohm battery-ground pulsing at 12 pps, 49% break over 0-ohm loop
Output (at DPT)	37% break minimum
Input (at DPO)	Loop pulsing at 12 pps, 68% break, with 2 uF and 600 ohms across pulsing contact, over 600-ohm VF extension to the channel unit
Output (at DPT)	66% break maximum

TABLE B (CONT)

ITEM	SPECIFICATION
Input (at DPO)	Loop pulsing at 12 pps, 58% break, with 2 uF and 600 ohms across pulsing contact, with no VF extension to the channel unit
Output (at DPT)	45% break minimum
SDPO/DPT Channel Units	
Pulsing Distortion	
Input (at SDPO)	Loop pulsing at 12 pps, 64% break with 1500 ohms external loop resistance
Output (at DPT)	65% break maximum
Input (at SDPO)	Loop pulsing at 12 pps, 58% break, 4 C4A ringers and 15 k ohms leak resistance
Output (at DPT)	40% break minimum
Input (at SDPO)	150/150-ohm battery-ground pulsing at 12 pps, 73% break over 2000-ohm loop conductors
Output (at DPT)	74% break maximum
Input (at SDPO)	150/150-ohm battery-ground pulsing at 12 pps, 49% break over 0-ohm loop
Output (at DPT)	39% break minimum
OPERATING ENVIRONMENT	
Temperature	0 to +55°C
Humidity	To 95% at 40°C (no condensation)
Altitude	To 14,000 ft (4,300 m)
DIMENSIONS	
Width	0.8 in. (1.9 cm)
Height	5.9 in. (15.0 cm)
Depth	9.7 in. (24.6 cm)
WEIGHT	1.0 lb (0.5 kg)

8. REPLACEABLE PARTS

8.01 This unit has no field-replaceable parts.

9. REFERENCES

9.01 The engineering drawings noted in Table C were used in the preparation of this Section.

TABLE C

TYPE	DRAWING NO.
Assembly	628170-000
Schematic	628170-002

9.02 Related information on the DPT9I and DPT6I channel unit may be found in the ITTR Sections referenced in Table D.

TABLE D

TITLE	SECTION NO.
Connectorized Multiplex Shelf (MS/WC7, MS/WC5, MS/C7 and MS/C6), 628001, 628005, 628011 and 628015 (For 23-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-405
Connectorized Multiplex Shelf (MS19/WC7, MS19/WC5, MS19/C7 and MS19/C6), 628003, 628008, 628013 and 628018 (For 19-Inch Bays) — Option Selection, Installation and Pretest	ITTR-18-406
Trunk Channel Units — Option Selection and Installation	ITTR-18-440